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Bank Profitability and Mergers in the German Cooperative Banking Sector

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Abstract

This paper evaluates bank performance as a determinant of mergers in the German cooperative banking sector. Based on annual time series data since 1990, a bivariate Vector Error Correction (VEC) model is specified and estimated. The results identify return on equity (ROE) as a driver of mergers. The higher ROE, the higher the merger intensity, defined as the ratio of mergers by the number of last years' banks. A reverse causality cannot be found as mergers do not significantly affect ROE. The results confirm some literature findings that were obtained from cross-section data. Our findings do not confirm the hypothesis that mergers are induced by worse economic performance.

JEL classification numbers: G21, G34, L25, P13.
Keywords: Bank mergers, cooperative banks, bank profitability, VEC model.

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1. Introduction

The merger wave among German credit cooperatives continues. In 2021 there were 42 mergers, up from 27 in 2020; currently there are still 772 independent cooperative banks (Stappel 2022). In 1990 there were 3344 independent credit cooperatives. While various studies on the success of mergers in Germany (Abeska 2014 for cooperatives, Koetter 2008, Lang and Welzel 1999) and other countries have been published in the meantime, there are hardly any empirical studies dealing with the determinants of merger activity in the German cooperative banking sector. Stappel (2022) explains the various merger waves ad hoc with certain factors (reunification, regulatory requirements, digitization), but does not perform statistical hypothesis testing. Dreesen and Horsch (2022) only present a descriptive analysis of concentration ratios. Otherwise, there are no studies that are specifically targeted on the German cooperative sector.

2. Literature Findings

There is some literature on merger determinants in high-income countries that allows conclusions about potential determinants of merger activity in Germany's cooperative banking sector. Akkus et al. (2016) use a micro approach and evaluate mergers of US banks from an acquirer's respectively target's perspective. They find that motives as cost reduction, efficiency gains and market concentration play a major role. However, they also find that at least the performance of target banks is not a major determinant of mergers. These results can hardly be transferred to the German banking sector as the authors did not consider credit unions, which are strictly separated from ordinary banks in the US. The same applies to the review study of Figueiras et al. (2021). In general, more profitable banks acquire less profitable banks. Unfortunately, the authors seem to have included credit cooperatives, but do not distinguish between cooperatives and other banks in their empirical analysis. Bongini et al. (2007) specifically assess relationship banking of credit cooperatives in Italy, which is found highly profitable, even in the case of very small banks. Therefore, the need to create larger units via mergers, must be questioned. The main motivation behind mergers and acquisitions is expanding financial services and lowering credit risk, according to a study of Focarelli et al. (2003). But the authors do not include actual bank performance, and their analysis is restricted to Italian commercial banks. Specifically directed at credit cooperatives is the study by Cabo and Rebelo (2005). The authors examine the determinants of mergers between agricultural cooperative banks in Portugal. They find, that acquiring banks are typically large and profitable, whereas target banks tend to be small and less profitable. This implies that, on average, there should be a positive relationship between merger intensity and average profitability in a cross-sectional dimension.

This notion is supported by a study that evaluates the determinants of mergers and acquisitions among Finnish cooperative and savings banks (Huhtilainen et al. 2022). Though the sample mixes two types of regional banks, the result is similar. Large and efficient banks tend to merge with smaller and less profitable banks.

3. Data and Econometric Analysis

The approach presented here basically differs from existing studies. I do not focus on individual banks, but use the average values for the cooperative banking sector from a time series perspective. The period under consideration is from 1990 to 2021. The following variables will be included.

The merger intensity which is defined as

$$MI = \frac{No.of\ Banks_t - No.of\ Banks_{t-1}}{No.of\ Banks_{t-1}})$$

i.e. the annual percentage change. Data is from BVR (2022).

The following performance indicators are considered:

- rate of return on equity (ROE)
- cost-income ratio (CIR)
- net income before taxes (NIBT)

Data is retrieved from Deutsche Bundesbank (2022).

We will study the relationship between mergers and firm's profit indicators not by classical OLS as we do not distinguish dependent and independent variables, but consider all variables endogenous. Causality will be determined within a Vector Error Correction Model. Table 1 presents simple Pearson correlations between these variables (t-statistics in parentheses).

Table 1: Correlation Matrix

Correlation (t-Statistic)				
	MI	**ROE**	**CIR**	**NIBT**
MI	1.00			
ROE	-0.37 (1.99)	1.00		
CIR	0.60 (3.77)	-0.22 (1.14)	1.00	
NIBT	-0.54 (3.21)	0.63 (4.04)	-0.79 (6.42)	1.00

At first sight merger intensity is positively correlated with the cost-income ratio and negatively with return on equity and net income. Thus, it could be concluded that an unfavorable operational status is associated with a higher merger rate. However, nothing can be said about the direction of causality from these correlations, which are also consistent with the reverse direction of causality. Mergers may trigger lower profitability. An analysis of the direction of causality is therefore essential.

3.1 Order of Integration and Cointegration Test

The time series are first tested for the order of integration. Arltova and Fedorova (2016) tested the properties of widely applied unit root tests for different lengths of time series. As in our case the time series are very short $(n \approx 30)$, the most powerful tests are the ADF- und PP-tests, irrespective of the AR-term. The following table reports test results for ADF- and PP-test with a constant.

Table 2: Unit Root Tests

Variable	Test	Level	p-Value	First Difference	p-Value	Conclusion
MI	ADF	-2.518	0.122	-3.943	0.005	I(1)
	PP	-1.711	0.416	-4.058	0.004	I(1)
CIR	ADF	-1.327	0.601	-5.755	0.000	I(1)
	PP	-1.194	0.661	-5.811	0.000	I(1)
ROE	ADF	-3.604	0.013	-3.845	0.007	I(1)
	PP	-2.147	0.229	-3.880	0.007	I(1)
NIBT	ADF	-1.832	0.359	-5.205	0.000	I(1)
	PP	-1.832	0.359	-5.207	0.000	I(1)

The tests reveal that all variables are I(1), i.e. difference-stationary. ROE may be already considered I(0), but the level test statistic only exceeds the 5 percent critical value, but not the 1 percent critical value. The PP test clearly shows that ROE is not I(0), but I(1). As all variables contain a stochastic trend, OLS and Vector Autoregression models are inappropriate. We have to test for cointegration and finally estimate a Vector Error Correction Model (VECM).

In order to test for cointegration we apply the Johansen-Test. For the variable pairing MI-CIR no cointegration was found at all. Dubious results were obtained for the relationship between MI and NIBT. The Johansen trace test found cointegration, but only at the 5 percent. The Max-eigenvalue test rejected cointegration. We therefore decided for an overall rejection of cointegration. On the other hand, cointegration of MI and ROE is confirmed by both tests. The test results are presented in table 3.

Table 3: Cointegration Test

Unrestricted Cointegration Rank Test (Trace)				
Hypothesized		Trace	0.05	Prob.**
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Critical Value
None *	0.477499	20.53933	15.49471	0.0080
At most 1	0.131377	3.662007	3.841465	0.0557
Trace test indicates 1 cointegrating equation(s) at the 0.05 level				
* denotes rejection of the hypothesis at the 0.05 level				
**MacKinnon-Haug-Michelis (1999) p-values				
Unrestricted Cointegration Rank Test (Max-Eigenvalue)				
Hypothesized		Trace	0.05	Prob.**
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Critical Value
None *	0.477499	16.87733	14.26460	0.0189
At most 1	0.131377	3.662007	3.841465	0.0557
Max-eigenvalue test indicates 1 cointegrating equation(s) at the 0.05 level				
* denotes rejection of the hypothesis at the 0.05 level				
**MacKinnon-Haug-Michelis (1999) p-values				

The Trace test statistic as well as the Max-Eigenvalue statistic exceed their critical value thus confirming the existence of a cointegrating relation.

3.2 Vector Error Correction Model

Next the Vector Error Correction Model (VECM) is estimated. A VECM treats all variables as endogenous and simultaneously estimates the relationship in levels and in first differences. Long-run and short-run causality is determined within the model. In our bivariate case it takes the following form.

$$\Delta MI_t = \beta_0 + \sum_{i=1}^{n} \beta_{1i} \Delta MI_{t-i} + \sum_{i=1}^{n} \beta_{2i} \Delta ROE_{t-i} + \delta_1 ECT_{t-1} + \varphi_{1t} \quad (1)$$

$$\Delta ROE_t = \gamma_0 + \sum_{i=1}^{n} \gamma_{1i} \Delta ROE_{t-i} + \sum_{i=1}^{n} \gamma_{2i} \Delta MI_{t-i} + \varepsilon_1 ECT_{t-1} + \theta_{1t} \quad (2)$$

Cointegration requires δ_1 and ε_1 being significantly negative. The Error Correction Term (ECT) captures the long-run cointegrating relation. Estimation with the Johansen system estimator gives the following result.

Table 4: Vector Error Correction Model Estimates

Standard errors in ( ) & t-statistics in [ ]		
Lags interval (in first differences): 1 to 2		
Endogenous variables: MI ROE		
Deterministic assumptions: Case 3 (Johansen-Hendry-Juselius): Cointegrating relationship includes a constant. Short-run dynamics include a constant.		
Cointegrating Eq:	ECT(-1)	
MI(-1)	1.000000	
ROE(-1)	-0.025286	
	(0.00758)	
	[-3.33689]	
C	0.236962	
Error Correction:	D(MI)	D(ROE)
ECT(-1)	-0.109605	10.21108
	(0.03928)	(5.68625)
	[-2.79025]	[1.79575]
D(MI(-1))	0.067727	-54.60447
	(0.21333)	(30.8814)
	[0.31747]	[-1.76820]
D(MI(-2))	0.016731	26.08744
	(0.20974)	(30.3606)
	[0.07977]	[0.85925]
D(ROE(-1))	-0.002676	0.346909
	(0.00133)	(0.19253)
	[-2.01180]	[1.80188]
D(ROE(-2))	-0.002958	0.044366
	(0.00155)	(0.22472)
	[-1.90562]	[0.19743]
C	-0.001538	-0.173604
	(0.00273)	(0.39454)
	[-0.56440]	[-0.44002]
R-squared	0.460469	0.442306
Adj. R-squared	0.325586	0.302882
Sum sq. resids	0.003238	67.84825
S.E. equation	0.012724	1.841850
F-statistic	3.413842	3.172391

According to the estimated parameters the equations are as follows:

$$\Delta MI = - 0.1096*[MI(-1) - 0.0253*ROE(-1) + 0.2369] + 0.0677* \Delta MI(-1) + 0.0167*\Delta MI(-2) - 0.0027*\Delta ROE(-1) - 0.0029*\Delta ROE(-2) - 0.0015 \quad (3)$$

$$\Delta(ROE) = 10.2111*[MI(-1) - 0.0253*ROE(-1) + 0.2369] - 54.6045*\Delta MI(-1) + 26.0874*\Delta MI(-2) + 0.3469*\Delta ROE(-1) + 0.0444*\Delta ROE(-2) - 0.1736 \quad (4)$$

The first part in parentheses […] shows the cointegrating relationship which reveals a positive long-run relation between MI and ROE (the signs have to be reversed) which is highly significant (t-statistic = 3.336). This implies that higher profitability as proxied by return on equity triggers merger activity in the long-run. The coefficient of the lagged error correction term is significantly negative only in the first equation with D(MI) as dependent variable. We can thus conclude that there is long-run Granger-causality that runs from ROE to MI. There is no causality from MI to ROE as the ECT-coefficient is barely significant (t-statistic = 1.79). In the short-run, however, the relationship between MI and ROE is negative as indicated by the coefficients of ΔROE(-1) and ΔROE(-2), though the coefficients are very small in magnitude. The following impulse responses show the combined effect.

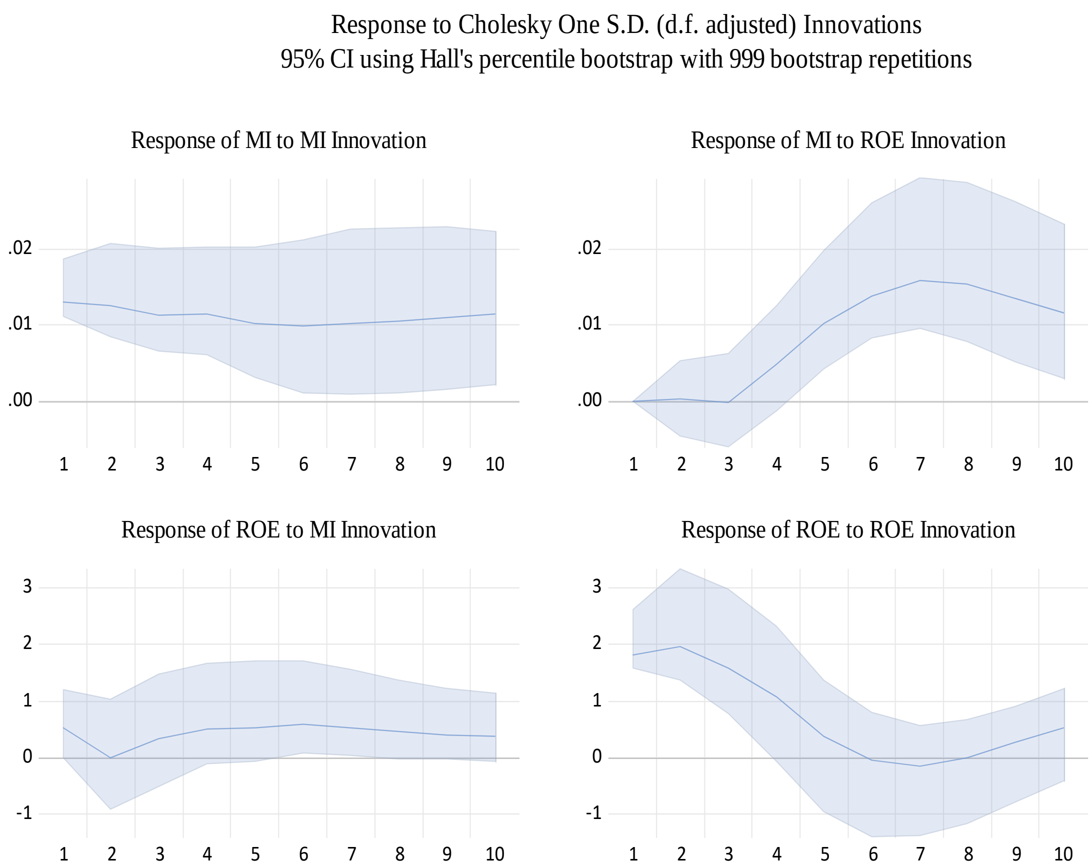

Figure 1: Impulse Responses

There is a strong positive impact of ROE on MI indicating that cooperative banks on average merge from a position of economic strength. That speaks against the hypothesis of restructuring mergers as a cause of merger waves. However, it takes up to seven years for the effect to fully manifest. This is likely due to long organizational delays in the merger process from first negotiations to official court registration. The Cabo and Rebelo (2005) and Huhtilainen et al. (2022) results so far are confirmed, on a time series basis. The response of ROE to MI innovation, though positive, is not significant which confirms the unclear and contradicting results of the literature on merger success. This also implies that the alleged positive effects on fixed costs and economies of scale in the case of mergers, cannot be confirmed, at least not in Germany's cooperative banking sector.

4. Conclusion

The relationship between bank performance indicators and mergers in the sector of German cooperative banks has been explored. A Vector Error Correction model has been estimated based on time series data after German re-unification. The main result is that bank performance, as proxied by return on equity positively affects merger activity. Cooperative banks on average do not merge by necessity. Unidirectional causality is found, as mergers do not affect bank performance. These results confirm findings of earlier cross-section studies.

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